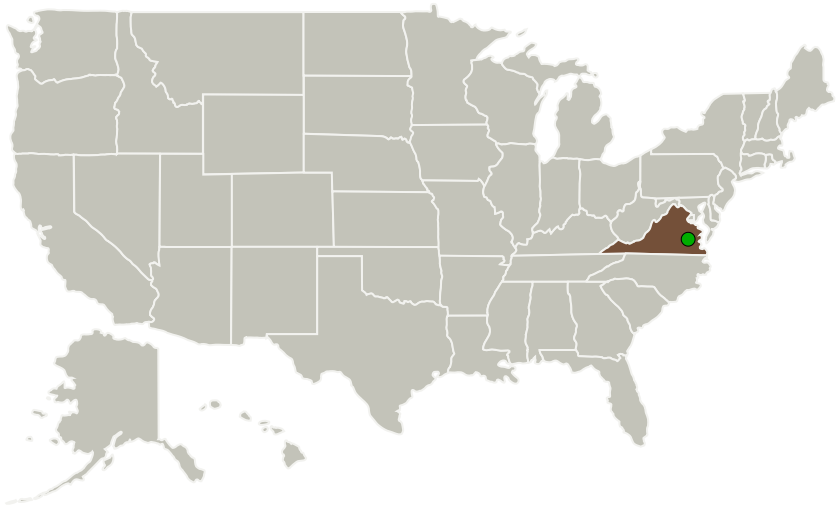
Novel Solid State Lasers for Space-Based Water Vapor DIAL, Phase II

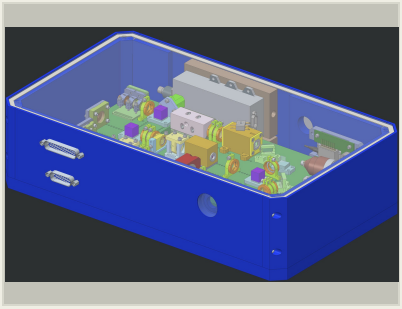
Completed Technology Project (2016 - 2020)

Project Introduction

This Phase II program will develop novel laser transmitters needed for planned airborne and space-based active remote sensing missions. This program will build on successful Phase I work to provide a Technology Readiness Level 4 (TRL-4) laboratory brassboard demonstrator of a new laser source for Differential Absorption Lidar (DIAL) measurements of atmospheric water vapor with secondary capability for methane characterization as well. Accurate measurements of both atmospheric constituents are critical to the understanding of global energy transport and climate change. Under our Phase I program, Fibertek successfully demonstrated the capability of a new laser source, a diode-pumped frequency-doubled Er:YAG laser to generate millijoule output near 823 nm that was tunable through water-vapor absorption lines for DIAL measurements. The new laser system offers simplicity and efficiency that will reduce risk for future airborne and space-based missions. Significantly, the new laser approach offers an upgrade path with reduction in size, weight, and power (SWaP) consumption over current state-of-the-art DIAL based on less-efficient non-linear parametric conversion of diode-pumped Nd:YAG lasers. This new-generation technology reduces the size and weight of flight hardware to make it compatible with affordable, more capable airborne and satellite payloads. In Phase II we propose to build on our successful Phase I demonstration to develop a full scale water vapor laser transmitter source, meeting or exceeding requirements for planned DIAL instruments.

Primary U.S. Work Locations and Key Partners





Novel Solid State Lasers for Space-Based Water Vapor DIAL, Phase II

Table of Contents

Novel Solid State Lasers for Space-Based Water Vapor DIAL, Phase II

Completed Technology Project (2016 - 2020)

Organizations Performing Work	Role	Type	Location
Fibertek, Inc.	Lead Organization	Industry	Herndon, Virginia
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

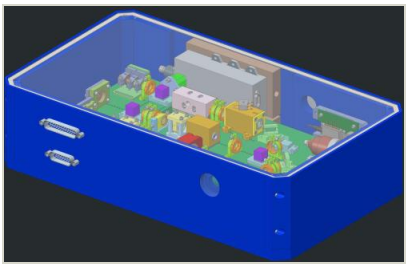
June 2016: Project Start

June 2020: Closed out

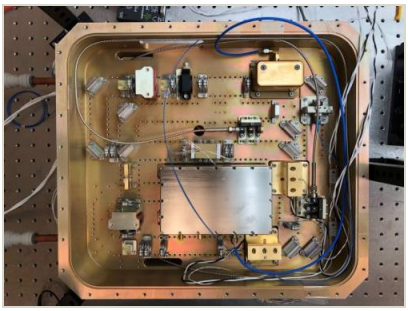
Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/139856)*

Images



Briefing Chart Image
Novel Solid State Lasers for Space-Based Water Vapor DIAL, Phase II *(https://techport.nasa.gov/image/133377)*



Final Summary Chart Image
Novel Solid State Lasers for Space-Based Water Vapor DIAL, Phase II *(https://techport.nasa.gov/image/126487)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Fibertek, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Patrick M Burns

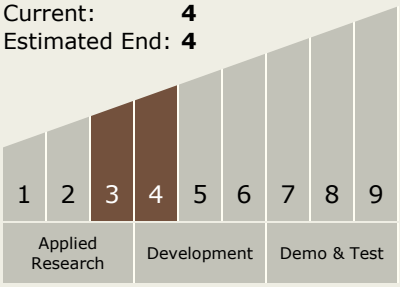
Co-Investigator:
Pat Burns

Novel Solid State Lasers for Space-Based Water Vapor DIAL, Phase II

Completed Technology Project (2016 - 2020)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.3 In-Situ Instruments and Sensors
    - TX08.3.4 Environment Sensors

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System